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10/780,847	02/17/2004	John Anderson	021751-005200US	2516

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EXAMINER	
DAY, HERNG DER	
ART UNIT	**PAPER NUMBER**
2128	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/08/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/780,847	ANDERSON, JOHN	
	Examiner	Art Unit	
	Herng-der Day	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/17/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-29 have been examined and rejected.

Specification

2. The disclosure is objected to because of the following informalities. Appropriate correction is required.

2-1. It appears that "fluid simulation 200", as described at line 2 of paragraph [0019], should be "fluid simulation 400".

2-2. It appears that "Region 270", as described at line 7 of paragraph [0020], should be "Region 470".

2-3. As described at line 7 of paragraph [0025], "and any other image processing information to create a final image or frame." (Emphasis added.)

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-27 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for each of the spray particles is assigned a state of velocity, does not reasonably provide enablement for each of the spray particles is assigned a state other than velocity. The specification does not enable any person skilled in the art to which it pertains, or

with which it is most nearly connected, to use the invention commensurate in scope with these claims.

4-1. Claims 1 and 17 recite the limitation "the spray particle having a state derived from the attributes of the fluid surface; and moving the spray particle according to at least its state" in each claim. However, as described at lines 2-3 of paragraph [0022], "The spray particles are assigned a velocity based on the weighted velocity of adjacent grid points." Accordingly, when the spray particle is assigned a state other than velocity the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention. Furthermore, because the assigned velocity is based on the *weighted velocity of adjacent grid points* the original disclosure does not appear to have reasonably provided enablement for the claimed limitation "having a state derived from the attributes of the *fluid surface*".

4-2. Claims 11 and 27 recite the limitation "the additional spray particle having a state derived from the attributes of the fluid surface" in each claim. However, as described at lines 2-3 of paragraph [0022], "The spray particles are assigned a velocity based on the weighted velocity of adjacent grid points." Accordingly, when the additional spray particle is assigned a state other than velocity the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention. Furthermore, because the assigned velocity is based on the *weighted velocity of adjacent grid points* the original disclosure does not appear to have reasonably provided enablement for the claimed limitation "having a state derived from the attributes of the *fluid surface*".

4-3. Claim 12 recites the limitation "wherein the plurality of spray particles is assigned a state based derived from the state of the set of fluid particles". However, as described at lines 2-3 of paragraph [0022], "The spray particles are assigned a velocity based on the weighted velocity of adjacent grid points." Accordingly, when the spray particle is assigned a state other than velocity the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention.

4-4. Claims not specifically rejected above are rejected as being dependent on a rejected claim.

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 1, 3-12, 15-17, and 19-29 are rejected under 35 U.S.C. 101 because the inventions as disclosed in claims are directed to non-statutory subject matter.

6-1. Claims 1, 3-12, 15-17, and 19-27 are directed to animating fluid. This claimed subject matter lacks a practical application of a judicial exception (law of nature, abstract idea, naturally occurring article/phenomenon) since it fails to produce a useful, concrete and tangible result.

Specifically, the claimed subject matter does not produce a tangible result because the claimed subject matter fails to produce a result that is limited to having real world value rather than a result that may be interpreted to be abstract in nature as, for example, a thought, a computation, or manipulated data. More specifically, the claimed subject matter provides for animating fluid (i.e., determining a fluid surface and moving the spray particle) without any

rendering step. This produced result remains in the abstract and, thus, fails to achieve the required status of having real world value.

6-2. Claims 28 and 29 are directed to tangible media including a first image and a consecutive image. In other words, the claimed subject matter is nonfunctional descriptive material recorded on tangible media, which is not statutory because no requisite functionality is present to satisfy the practical application requirement.

6-3. The Examiner acknowledges that even though the claims are presently considered non-statutory they are additionally rejected below over the prior art. The Examiner assumes the Applicant will amend the claims to overcome the 101 rejections and thus make the claims statutory.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Foster et al., "Practical Animation of Liquids", SIGGRAPH 2001, August 2001, pages 23-30. (IDS AE, filed February 17, 2004).

8-1. Regarding claim 1, Foster et al. disclose a method of animating fluid, comprising:

determining a fluid surface at a first time value according to a fluid simulation (Using (5.2), the surface position is evolved over time by tracking $\phi(x)=0$, page 26, left column, paragraph 1);

adding at least one spray particle beneath the fluid surface (Particles are placed (or introduced via a source) into the grid according to some initial liquid distribution, page 25, left column, paragraph 3), the spray particle having a state derived from the attributes of the fluid surface (Particle velocity is computed directly from the velocity grid, page 25, left column, paragraph 3); and

moving the spray particle according to at least its state (each particle is moved according to the inertialess equation $dx_p/dt = v_x$, page 25, left column, paragraph 3).

8-2. Regarding claim 2, Foster et al. further disclose comprising:

rendering the fluid surface (All of these images were rendered using a ray-tracing algorithm, page 28, right column, paragraph 4); and

rendering the spray particle in response to the spray particle being above the fluid surface (These particles can be rendered directly as small liquid drops, page 26, right column, paragraph 1).

8-3. Regarding claim 3, Foster et al. further disclose wherein determining a fluid surface comprises:

solving a level set equation to determine a zero level corresponding to the fluid surface (allowing the level set function to give a very smooth representation of the liquid surface, page 26, left column, the last paragraph).

8-4. Regarding claim 4, Foster et al. further disclose wherein determining a fluid surface further comprises:

simulating a set of fluid particles to determine a state of the set of fluid particles at the first time value (to indicate whether or not the surface is smooth, page 26, left column, the last paragraph); and

solving the level set equation to determine the zero level using the state of the set of fluid particles (allowing the level set function to give a very smooth representation of the liquid surface, page 26, left column, the last paragraph).

8-5. Regarding claim 5, Foster et al. further disclose wherein adding at least one spray particle comprises:

solving the level set equation to determine a non-zero level corresponding to a boundary surface; and adding the spray particle to a boundary region between the fluid surface and the boundary surface (If a particle is more than a few grid cells away from, and inside the surface, as indicated by the locally interpolated value of ϕ, then that particle is deleted, page 26, left column, paragraph 3).

8-6. Regarding claim 6, Foster et al. further disclose wherein adding at least one spray particle comprises adding the spray particle to a region within a specified depth from the fluid surface (a few grid cells away from, and inside the surface, as indicated by the locally interpolated value of ϕ, page 26, left column, paragraph 3).

8-7. Regarding claim 7, Foster et al. further disclose wherein moving the spray particle comprises moving the spray particle in accordance with a ballistic simulation based upon at least

the state of the spray particle (each particle is moved according to the inertialess equation $dx_p/dt = v_x$, page 25, left column, paragraph 3).

8-8. Regarding claim 8, Foster et al. further disclose wherein the ballistic simulation includes an approximation of the force of gravity on the spray particle (This equation models the changes in the velocity field over time due to the effects of …, and gravity(g), page 24, right column, paragraph 1).

8-9. Regarding claim 9, Foster et al. further disclose comprising:

removing the spray particle in response to the spray particle being below the specified depth from the fluid surface (If a particle is more than a few grid cells away from, and inside the surface, as indicated by the locally interpolated value of ϕ, then that particle is deleted, page 26, left column, paragraph 3).

8-10. Regarding claim 10, Foster et al. further disclose comprising:

removing the spray particle in response to the spray particle being below the boundary surface (If a particle is more than a few grid cells away from, and inside the surface, as indicated by the locally interpolated value of ϕ, then that particle is deleted, page 26, left column, paragraph 3).

8-11. Regarding claim 11, Foster et al. further disclose comprising:

determining the fluid surface at a second time value according to the fluid simulation (Using (5.2), the surface position is evolved over time by tracking $\phi(x)=0$, page 26, left column, paragraph 1);

adding at least one additional spray particle beneath the fluid surface (Particles are placed (or introduced via a source) into the grid according to some initial liquid distribution, page 25,

left column, paragraph 3), the additional spray particle having a state derived from the attributes of the fluid surface (Particle velocity is computed directly from the velocity grid, page 25, left column, paragraph 3); and

moving the spray particle and the additional spray particle according to at least their respective states (each particle is moved according to the inertialess equation $dx_p/dt = v_x$, page 25, left column, paragraph 3).

8-12. Regarding claim 12, Foster et al. disclose a method of animating a fluid, comprising:

determining a state of a set of fluid particles at a first instance of time using a fluid simulation (Particle velocity is computed directly from the velocity grid, page 25, left column, paragraph 3);

defining a fluid surface from the state of the set of fluid particles (Using (5.2), the surface position is evolved over time by tracking $\phi(x)=0$, page 26, left column, paragraph 1);

defining a boundary region between the fluid surface and a specified depth from the fluid surface (a few grid cells away from, and inside the surface, as indicated by the locally interpolated value of ϕ, page 26, left column, paragraph 3);

adding a plurality of spray particles to the boundary region (Particles are placed (or introduced via a source) into the grid according to some initial liquid distribution, page 25, left column, paragraph 3), wherein the plurality of spray particles is assigned a state based derived from the state of the set of fluid particles (Particle velocity is computed directly from the velocity grid, page 25, left column, paragraph 3);

moving the plurality of spray particles according to at least the state of the plurality of spray particles (each particle is moved according to the inertialess equation $dx_p/dt = v_x$, page 25, left column, paragraph 3); and

removing a portion of the plurality of spray particles in response to the portion of the plurality of spray particles being located below the specified depth from the fluid surface (If a particle is more than a few grid cells away from, and inside the surface, as indicated by the locally interpolated value of ϕ, then that particle is deleted, page 26, left column, paragraph 3).

8-13. Regarding claim 13, Foster et al. further disclose comprising:

rendering the fluid surface (All of these images were rendered using a ray-tracing algorithm, page 28, right column, paragraph 4); and

rendering a second portion of the plurality of spray particles (These particles can be rendered directly as small liquid drops, page 26, right column, paragraph 1).

8-14. Regarding claim 14, Foster et al. further disclose wherein the second portion of the plurality of spray particles is located above the fluid surface (these stray particles could be used as control particles to indicate the presence of fine spray or mist, page 26, right column, paragraph 1).

8-15. Regarding claim 15, Foster et al. further disclose

wherein determining the fluid surface comprises solving a level set equation for a zero level corresponding to the fluid surface (Using (5.2), the surface position is evolved over time by tracking $\phi(x)=0$, page 26, left column, paragraph 1); and

wherein determining the boundary region comprises solving the level set equation for a non-zero level corresponding to a surface at the specified depth from the fluid surface (a few grid

cells away from, and inside the surface, as indicated by the locally interpolated value of ϕ, page 26, left column, paragraph 3).

8-16. Regarding claim 16, Foster et al. further disclose wherein moving the plurality of spray particles comprises:

moving the plurality of spray particles in accordance with a ballistic simulation (each particle is moved according to the inertialess equation $dx_p/dt = v_x$, page 25, left column, paragraph 3).

8-17. Regarding claims 17-27, these medium claims include the same method limitations as in claims 1-11 and are anticipated using the same analysis of claims 1-11.

8-18. Regarding claim 28, Foster et al. disclose a tangible media including a first image including a fluid surface and a spray particle each having a first state, and a consecutive image including the fluid surface and the spray particle each having a second state, wherein the first and second states of the spray particle are created according to the method of claim 1 (Figure 4, page 26).

8-19. Regarding claim 29, Foster et al. disclose a tangible media including a first image including a fluid surface and a plurality of spray particles each having a first state, and a consecutive image including the fluid surface and the plurality of spray particles each having a second state, wherein the first and second states of the plurality of spray particle are created according to the method of claim 12 (Figure 4, page 26).

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure.

Reference to Da Vitoria Lobo et al., U.S. Patent 5,537,641 issued July 16, 1996, is cited as disclosing a method for physically-based modeling of 3D general fluid animation.

Reference to Colwell, U.S. Patent 5,877,777 issued March 2, 1999, is cited as disclosing a fluid dynamics animation system.

Reference to Stam et al., U.S. Patent 6,266,071 B1 issued July 24, 2001, is cited as disclosing a method for performing computer graphic simulation of a fluid in motion.

Reference to Davis et al., U.S. Patent 7,085,689 B2 issued August 1, 2006, and filed March 12, 2001, is cited as disclosing a method for creating a simulated particle pack.

Reference to O'Brien et al., "Dynamic Simulation of Splashing Fluids", Proceedings of the Computer Animation, April 1995, is cited as disclosing a method for modeling the dynamic behavior of splashing fluids.

Reference to Mould et al., "Modeling Water for Computer Graphics", Computers & Graphics, Volume 21, Issue 6, 1997, pages 801-814, is cited as disclosing modeling water.

Reference to Muller et al., "Particle-Based Fluid Simulation for Interactive Applications", Proceedings of the 2003 ACM SIGGRAPH/Eurographics Symposium on Computer Animation, July 2003, is cited as disclosing an interactive method based on SPH to simulate fluids with free surfaces.

Reference to Premoze et al., "Particle-Based Simulation of Fluids", Eurographics 2003, September 2003, is cited as disclosing a particle interaction method for simulating fluids.

10. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Herng-der Day whose telephone number is (571) 272-3777. The Examiner can normally be reached on 9:00 - 17:30.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: (571) 272-2100.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kamini S. Shah can be reached on (571) 272-2279. The fax phone numbers for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Herng-der Day
February 5, 2007 H.D.

KAMINI SHAH
SUPERVISORY PATENT EXAMINER